

IEEE EMC SOCIETY

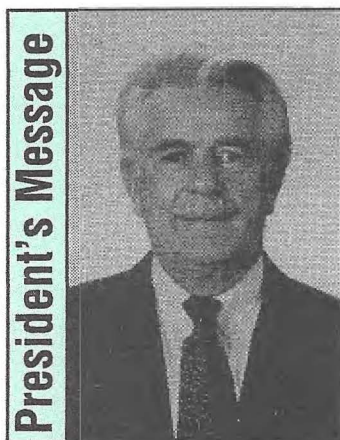
NEWSLETTER

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ROBERT D. GOLDBLUM, Editor



BILL GJERTSON
PRESIDENT,
EMC SOCIETY

As we near the midpoint of the 1996 calendar year, it is a good idea to reflect on the accomplishments to date, and finalize the plans for the second half of the year. One activity that comes to mind is the 1996 IEEE EMC Society International Symposium to be held at the Santa Clara Convention Center from August 19 to 23, 1996. You are encouraged to join your engineering colleagues at this great event. The advance program is out and additional information has been provided by the symposium committee on their symposium-specific "web home page." The EMC Symposium is a place for each of you and your colleagues, regardless of membership, to obtain the latest EMC information, especially on regulations which may affect you and your individual success. Plan to attend and please visit the EMC Society booth at the Symposium to share information needed for our annual symposium survey.

The EMC Society Board of Directors meeting is also open (9:00 to 5:00 on Sunday, August 18, 1996) and you are invited to attend if you wish to collect survey data. I would like to quote one sentence from Bob Goldblum, Editor of the *IEEE EMC Society Newsletter*. In one of his letters on the subject

of volunteers, he wrote, "The best way to become active with the IEEE EMCS Board of Directors or one of its committees is to attend at least one Board of Directors meetings and introduce yourself." I also believe the current volunteers present at these meetings will be of assistance to you. Each year the Society elects six new Directors and you can also best explore this avenue by attending a Board of Directors meeting at the Symposium.

This *IEEE EMC Society Newsletter* is another excellent way to obtain information on the EMC community, including the names of volunteers/colleagues that you may wish to support, assist, and work with while you enjoy the membership of the IEEE EMC Society. (See EMCS Directory on page 13.)

The IEEE and the EMC Society also have "home pages" on the Internet which should be of benefit to all. The EMC page contains news items, activities data and even job postings. Also listed are the names and E-mail addresses of a large number of EMC Society volunteers. I again encourage you to contact us, volunteer and make this (the IEEE EMC Society) the most active, most useful and most beneficial membership you possess.

As I return to my planning thoughts for 1996 and beyond, I realize how many opportunities are available. An IEEE Sections Congress will meet in Denver during the first week in November. While you are making your plans, be sure to note that information and the "call for papers" for the Zurich conference are also out. Many other conferences are listed in the calendar section of this newsletter (Page 26). If this is the year you "go on-line" with an E-mail address, let us hear from you through the home page or the E-mail addresses of the Board of Directors who will all be (some already are) on-line by August 1996. The address format is: firstinitial.lastname@ieee.org

IEEE ELECTROMAGNETIC COMPATIBILITY SOCIETY NEWSLETTER

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**ROBERT D. GOLDBLUM
EDITOR**

is that an error budget be given for every configuration used in an EMC test. For instance, the accuracy of LISNs, antennas, cables, receivers, measurement distances, and site imperfections must all be calculated through a sophisticated probability distribution method, and these uncertainties must be included in test plans, test reports, and resultant test data. If an uncertainty for a specific measurement is 5 dB, the level measured must be 5 dB within the specification limit to pass the requirement without question.

This is all very good, but I wonder how we existed all these years without this added sophistication to EMI measurements. It is important that measurements be made accurately within a specified tolerance. However, the accuracy of the measurements largely depends upon the need for accuracy. It is not a secret that the limits in military EMI specifications are "negotiated" between various governmental departments and agencies. Although they establish a requirement criteria, MIL-STD-461 is not a quality assurance standard. In the United States, emphasis is on the concept of control with reasonable accuracy assurances, not theoretical test uncertainty as presented in the NAMAS standards. Thus, I do not expect that the military or other governmental agencies will adopt the NAMAS concepts in the foreseeable future. I would like to believe that the FCC recognizes "intent over absolute" when it comes to its measurements and also would not impose these uncertainty requirements. The EMI problems in Europe must be immense for the EU to adopt the NAMAS uncertainty as part of its EN test criteria.

The development of the uncertainty of measurements for a given test laboratory can be very complex and expensive. Every possible test configuration must be examined, documented, and calculated. Ten different antennas with ten different cables plus three different test distances and six different receivers provide a very complex set of combinations, each of which requires uncertainty calculation and verification. Do we really need this?

I have recently been introduced to the European concept of the treatment of uncertainty in EMC measurements. It would appear that a major European EMC laboratory accreditation organization, NAMAS, has published several documents on the topic. One is NAMAS Accreditation Standard NIS80, which provides general guidance on estimating and reporting uncertainties in testing. NAMAS NIS81 gives a detailed dissertation on the treatment of uncertainty in EMC measurements. What is basically proposed

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emphasis is on the
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BACK ISSUES OF THE EMC SOCIETY NEWSLETTERS ON MICROFICHE

We still have a few sets of the microfiche copies of the back issues of the IEEE EMC Society Newsletters from the present to 1955, when it was called "Quasies and Peaks." The price is \$25.00 postpaid. Sets can be ordered from: Dr. Chester L. Smith, EMC Society Historian, 2 Jonathan Lane, Bedford, MA 01730.

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IEEE EMC Society Newsletter Publication Schedule

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November	September 15
February	December 15
May	March 15
August	June 15

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TODD HUBING
ASSOCIATE EDITOR

Perhaps you saw the recent news story about how the computer game, Doom II, is being used to facilitate military training. There are also computer games that teach people about being a pilot, a city planner, and even a surgeon. Young men and women raised in the "video age" are supposed to respond well to this type of training. If we're going to attract sharp young minds into the EMC profession, it's clear that we are going to have to develop a computer game of our own. We could call it EMC2000!

EMC2000 players would start out as junior EMC engineers for Megabucks, Inc. Products with various EMC problems would appear in the engineer's laboratory at irregular intervals. Players would race against time and budget constraints to make the products compliant with all applicable EMC requirements.

For example, a prototype high-speed modem appears in the lab. The product announcement is four weeks away. You schedule and complete various EMC tests only to find out two weeks later that the prototype has a radiated EMI problem. You probe the design and determine that the problem is a digital clock signal coupling to an analog output. You could solve the problem with a board layout change, but there is not enough time. Reaching into your bag of EMC fixes, you pull out a metal enclosure. Too expensive. You try a variety of ferrites, shields, and filters. None of them work. Finally with two hours to spare, you discover that the system is over designed and that reducing the clock frequency by 25% allows you to meet all EMC requirements without sacrificing system performance. Your solution salvages a 20 billion dollar project. You save the company 3 million dollars in the first week. You receive a nice plaque from your manager.

Pretty exciting, huh? It will make every kid want to be an EMC engineer. But wait, there's more! Every good computer game has different worlds to visit. In EMC2000 you can visit Coffee Break World, Business Meeting World, and more!

Short visits to Coffee Break World can give your brain a break from the monotony or frustration of trying to solve a difficult EMC problem. Other players visiting Coffee Break World may be able to give you EMC tips or advice on how to play the game. As an added incentive to visit this world, you can play short

games of chance with the other players to see who buys the coffee.

Players are generally drawn into Business Meeting World against their will. The clock keeps ticking while you are in Business Meeting World and it is impossible to make progress on your product. Nevertheless, you must go when you are called and you must be alert when you are there. Sometimes the rules of the game are changed in Business Meeting World.

Opportunities to enter Continuing Education World come and go during the course of the game. In Continuing Education World, players get new fixes to add to their collection and they learn how to apply them to products that they have not yet encountered. It is to a player's advantage to spend some time in Continuing Education World. In fact, it is difficult to succeed at this game without entering Continuing Education World periodically. The trick is finding an open door to this world at a time when urgent EMC problems aren't compelling the player to remain in the laboratory.

When products leave the player's laboratory, they may never be seen again or they may show up in Field Problem World. Field problem world is sort of like jail in Monopoly. When a player is told to go to Field Problem World, all other activities and progress must cease. The player goes directly to Field Problem World, does not pass GO, and does not collect \$200. A player must remain in Field Problem World until the problem is fixed or until another player is sent there.

Once a year, players are sent to Manager's Office World to determine whether they are ready to advance to the next level. In Manager's Office World, a player's score is totaled according to the following formula:

$$\text{score} = (a/b) + c$$

where: a is the number of compliant products shipped

b is the total number of products that came into lab

c is a random number between 1 and 10.

If your score is greater than 8, you advance to the next level. Otherwise, you repeat the last level. Of course, the game is exactly the same at all levels, but there is a certain amount of satisfaction just knowing that you are playing at a higher level.

What do you think? Kids will love it, right? It's bound to be more popular than a game like Doom II where players merely walk around shooting at things. Of course the marketing people may feel that the game is too realistic. They will probably want a few changes. For example, the products will probably blow up if they are not compliant in time to ship. Gremlins will probably lurk throughout the laboratory loosening screws, changing equipment settings and spitting at the players. Managers will probably be equipped with laser-guided missile launchers, causing players to use mirrors to defend themselves. Still, the game will be pretty much like business as usual in the EMC laboratory.

There is one additional world that should probably be a part of EMC2000. Players should be afforded the opportunity to enter IEEE EMC Chapter Meeting and Symposia World once in a while. This world would enable players to collect EMC fixes and learn secrets that help them to advance quickly. Very little time would be required to enter IEEE EMC Chapter Meeting and Symposia World and it would be one of the best moves a player could make.

I can't wait until this game comes out. When it does, the world is bound to become a much more compatible place. Nevertheless, I think I'll avoid playing EMC2000 on the plane during takeoff and landing.

Central New England

The final meeting for the 1995/1996 season was held on Tuesday May 21, 1996. Approximately 30 people were present to hear Art Wall, Chief of the FCC's Customer Service Branch, give a presentation titled, "Overview of the US-EU MRA Negotiations for Telecommunications." The FCC has been participating in negotiations to develop a Mutual Recognition Agreement (MRA) between the USA and European Union (EU). The MRA talks were initiated at the request of certain U.S. industry groups (e.g. the Telecommunication Industry

Association and Information Technology Industry Council) to allow U.S. manufacturers the opportunity to test and approve (in the U.S.) products going to Europe. The MRA would also provide the EU with the same opportunity to test and approve equipment for the U.S. market. The presentation included an overview of the EU new approach directives, the Telephone Terminal Equipment (TTE) and EMC Directives and a discussion of the MRA negotiations with EU to date.

Central Texas

I would like to thank J. P. Ball, who sent the following report to me by e-mail.

The CENTEX EMC Chapter met at 6:30 P.M. in Austin, TX, at Tres Amigos Restaurant & Cantina. A social time was followed by dinner, and after dinner, the business meeting was held. The topics were election of chapter officers for the coming 1996-1997 season and a recap of the recent C63-NIST Workshop on Uncertainty in EMC Measurements. There were 17 attendees for this meeting.

The officers elected were:
Chairman: John D. M. Osburn, EMC Test Systems
Vice Chairman: James J. Polonis, Southwest Research Institute
Secretary/Treasurer: Eric Lifsey, National Instruments.

The C63-NIST Workshop on Uncertainty in EMC Measurements was held in Baltimore, MD, on Monday and Tuesday, April 29 and 30, 1996. It was very ably recapped by Mr. Edwin L. Bronaugh, EdB EMC Consultants, and Dr. Michael D. Fogelle, PhD, EMC Test Systems. Mr. Bronaugh was a presenter at the workshop and Dr. Fogelle attended. All of the attendees were impressed that measurement uncertainty was in their futures.

Mr. Bronaugh concentrated on what was presented and the overall conclusions reached at the workshop. Dr. Fogelle concentrated on some of the open questions as to how uncertainty measures and methods could be applied to some of the

measurements, e.g., IEC 1000-4-3. Both Dr. Fogelle and Mr. Bronaugh distributed handouts to the attendees summarizing their topics.

Mr. Bronaugh also recapped three CISPR ad hoc committee meetings, one writing a standards document on applying uncertainty to pass-fail criteria for EMC measurements, and one writing a CISPR standard for measurement of emissions above 1 GHz from microwave ovens. The products of the first two will appear in CISPR 16, and the third will probably be a separate publication.

Israel

The following report was sent in by Elya B. Joffe, chair of the Israeli Chapter.

The Israeli IEEE EMC Chapter held its first meeting for the year 1996 in the Holon Technological Education Center on March 25th. The meeting was hosted and arranged by Dr. Jacob Gavan, a professor in the Center and a Fellow of the IEEE EMC Society.

The meeting was chaired by Chapter Chairman Elya B. Joffe. There were 50 attendees(!) including 20 IEEE members. Several of those in attendance were students of Electrical and Communication Engineering. This was, therefore, a golden opportunity to expose those students to a variety of EMC issues and concerns.

The first part of the meeting was dedicated to the election of the Officers of the Chapter. Results of the elections reflected no change from the current board membership: Elya B. Joffe, Chair; Moshe Netzer, Vice Chair; and Moshe Henig, Secretary. Following elections, the technical part of the meeting commenced.

The main presentation of the evening was that of Mr. Uri Vered of TIL, Security Systems who gave a presentation on the "ELIRAN - Electromagnetic Immunity and Radiation Analysis" software package. ELIRAN is used for intersystem RF compatibility analysis from installation to arena levels. The presentation was accompanied by "on-line"

demonstrations of the software.

Following that presentation, a presentation on "Common Interference Modes in RF Compatibility Analysis between Collocated Transceivers" was presented by Dr. Gavan, a well-known expert in the field of RF compatibility and author of many papers on the subject. This presentation actually explained many of the analysis objectives of the "ELIRAN" system.

Dr. Alexander Axelrod of EMI Test Labs was the next speaker. His topic was "Common Mode Currents in an Electronic System - Sources and Phenomena." The presentation was accompanied by a demonstration of the classic experiment (first done by Prof. Clayton Paul, we believe), demonstrating the relationship between the common mode currents and the radiation from a circuit with cables. Special emphasis was placed on the effect of capacitor installation, common mode (line-to-ground) filtering vs. differential mode (line-to-line) filtering. This was a valuable demonstration for those who still doubt the existence and effect of the mysterious "common mode" currents. The highlight was the agreement demonstrated between the computed field from a given common mode current and the actual field measured, compared to the measured CM currents! Sometimes "seeing is believing" and no matter how educated

we may be - eyes are still easier to believe than books!

Closing the meeting was a short presentation by Dr. Moshe Russou from RAFAEL/ADA EMC group on an analysis tool for cable-to-cable coupling. This is a very useful tool for large bundle/cable installations where other types of analysis could be long and tedious.

A call for papers was issued for the 1996 19th Convention of Electrical and Electronic Engineers in Israel, which will take place in Jerusalem, on November, 1996. The Symposium will hold a session dedicated to EMC, which is being sponsored and organized by the Israel EMC Chapter. IEEE EMCS members worldwide are encouraged to participate in this event.

Again we encourage all EMCS members from the neighboring states to join us in our activities (See invitation on page 26). You will be more than welcome!!!

Los Angeles

COWABUNGA! The Los Angeles Chapter of the EMC Society hosted a "Surf the Net" party in May. This was a fun, informal evening wherein chapter members and their guests became acquainted with the wonders of the Internet. It was an informative and entertaining evening for all, complete

with a 6' sandwich, chips and sodas.

A computer was set up at the front of the room along with an LCD projector. Images from the computer CRT were projected onto a large screen for the audience to see. Quickly, terms such as http, URL, IP, CU-SeeMe, Reflector, Lurker, Webcrawler, home pages, Browser, ISDN, etc. etc. seemed to "surf" across the room. Some of the web sites visited included the IEEE EMC Society home page, the IEEE EMC Society 1996 International Symposium home page, EMC related job openings on the EMC Society home page, and the Center for Mobility resources (CMR) home page. This home page in particular was very interesting. It allows you to calculate your equivalent salary if you move to another city. For example, first you enter your current salary, the city and state where you reside, then you enter your "new" city and state. After pressing the calculate button, you'll see the new salary you will need to maintain your current life-style should you move. The results were eye-opening!

Chapter member Ray Waldemar introduced us to the video teleconferencing shareware developed at Cornell University. We were "lurkers" since we did not have a video camera, but we were able to see participants of an actual video conference. The video is only a few frames per second, but it is amazing!

Chapter chairman Ray Adams commented, "Think about it, video requires plenty of bandwidth and the Internet is bandwidth limited!" Ray concluded the evening by providing chapter members with a comprehensive list of EMC specific web pages and related web pages of interest. If you'd like to see this list, contact Ray by phone (310) 813-7152 or e-mail ray_adams@qmail4.sp.trw.com This meeting attracted some 35 members and guests which shows that there is still plenty to learn about the Internet. While most guests went home around 9:00 P.M., there were a few computer "hackers" who stayed until close to midnight! YAHOO!

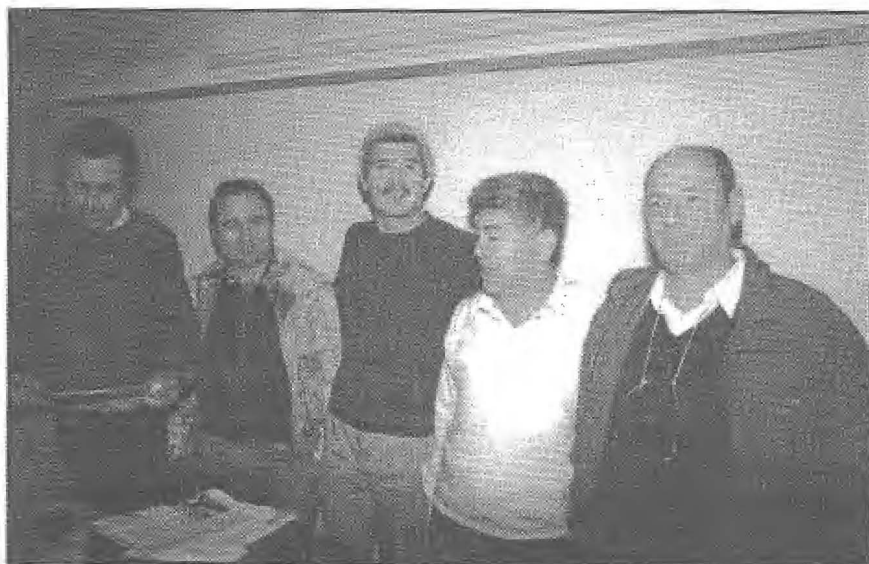


Photo courtesy of Elya Joffe

Attendees at Israeli Chapter meeting. (l-r) Moshe Henig, Moshe Netzer, Chapter Vice-Chairman, Elya Joffe, Chapter Chairman, Jacob Gavan, recently elected IEEE Fellow, and Uri Vered, Main Speaker.



LA Chapter members John Stanford and Kanaiya Mahendra (l-r) celebrate a great chapter year during the summer social.



After months of "adios," LA Chapter members (l-r) George Ufen, Jim Degerstrom, and Alan Barnard resurface to say "hola" to the crowd at the summer Fiesta.



The hostesses with the Mostesses! Joe and Virginia Fischer at the end of the buffet line at the LA Chapter end-of-the-year summer social (note sweater and parka in Southern California on June 20?!).

Photos courtesy of Janet O'Neil

In June, the chapter met for the traditional "end-of-the-year" summer social. Chapter members Virginia and Joe Fischer hosted the meeting at their home. It was a pool-side affair on Thursday evening, June 20, the eve of the first day of summer. You'd never know summer was just around the corner! Although most guests brought sweaters, Virginia, ever the gracious hostess, brought out a good supply of jackets and even parkas from her closets once the chilly fog

rolled in. (One guest requested a jacket that had money in the pockets!) Some 25 guests enjoyed a Mexican dinner buffet complete with beer and margaritas. Allen Fischer was the able bartender and Chapter Chairman Ray Adams was the able welcome wagon greeter at the door. The Fischers have a lovely home. However, it was revealed that the kitchen was remodeled due to Joe's shenanigans with the oven. Apparently, he used the oven to cure the epoxy in a current probe. The extent of the damage from this practice was never quite explained. To this day, though, Joe is not allowed to use the kitchen without Virginia's permission. After coffee, brownies and cookies, and the requisite EMC horror stories, the party concluded with all guests thanking the Fischers for their warm hospitality and agreeing to reconvene in September when the chapter's technical meetings resume.

Mail Bag

Following last year's article on EMC super heroes, Mr. Raymond Elsner from Littleton, CO sent in the following description of his own EMC super hero, "James Bondstrap, EMC Engineer."

The protagonist is James Bondstrap, a sophisticated member of the EMC community. He has a license, issued by this same EMC community, to kill RFI.

He is famous for his admonition to EMC technicians to mix his conductive epoxy by stirring, not shaking. He periodically visits with Max Q, the director of his company's EMC laboratory, who instantly teaches him how to operate the newest secret weapons against RFI.

Mr. Bondstrap faces innumerable challenges from people who try to delete EMC requirements from electrical and electronic equipment, subcontracted by his company, to save money for their own companies. These villains have the idea that if he is eliminated or nullified, they will be successful in bypassing EMC requirements, thus gaining them the coveted "Bean Counter Award" from their ecstatic companies.

Women are thrown at him in efforts to get him to forsake EMC specifications. He appears to succumb to their blandishments but EMC ethics always win in the end.

In the current episode, the evil equipment suppliers find a loophole in their contract with Bondstrap's company and write their EMC compliance documentation in Sanskrit. Mr. Bondstrap has no trouble reading them: if he can decipher American government EMC specifications, then obviously he can understand anything written in any language, ancient or modern.

Pikes Peak

John Will, Chair of the Pikes Peak chapter completed the final requirements for the Degree of Doctor of Philosophy in the Electrical and Computer Engineering Department at the University of Colorado in Colorado Springs. His thesis title was "Complex Antenna Pattern Measurements using Infrared Imaging and Microwave Holography." Congratulations, Dr. Will!



JOSEPH E. BUTLER
ASSOCIATE EDITOR

SAE AUTOMOTIVE EMI & EMR COMMITTEE

Edwin Bronaugh
RAC Representative

These committees, which meet quite regularly, have been working on a TEM device standard for immunity testing of vehicle components. This standard would include both Crawford and flared (GTEM) TEM cells.

SAE AE-4 ELECTROMAGNETIC COMPATIBILITY

Gary Fenical
RAC Representative

The SAE-4 EMC committee met most recently in May in Kansas City, MO. Efforts of this committee include continuing work on a revised SAE ARP 1173 radiated test method for EMI gasket shielding effectiveness, and a revised SAE ARP 1705 on EMI gasket transfer impedance measurement.

SAE AE-4R RADIATED ENVIRONMENTS

Ken Grachan
Chair

This subcommittee has continued to work on the High Intensity Radiated Fields (HIRF) requirement for commercial aircraft. Although the work by the committee in developing a draft FAA Advisory Circular was completed some time ago, it was neither accepted as an SAE ARP document nor adopted by the FAA. Work on the accompanying users' manual has continued as regards detailing test and analysis methods. One area of significant concern, which is far from resolution, is the rotorcraft radiated environment definition.

SAE AE-4L LIGHTNING

R. Hess/A. Plumer
Co-Chairs

A second edition of the Orange Book has been issued. The committee has also been working on an Orange Book User's Manual and Testing standard. A new zoning document is also under preparation by the committee.

ANSI C63.1 EMI TECHNIQUES AND DEVELOPMENTS

Don Heirman
RAC Representative

Work continues on the long-awaited equipment immunity standard (C63.15) with an expected completion some time this year.

ASC SC63.8 EMC TESTING STANDARD FOR ELECTROMEDICAL DEVICES (EMD)

Dan Hoolihan
Chair

This subcommittee, which was derived from SC63.1, has been actively working on two projects. The working group for on-site testing is nearing completion with the goal of providing a guide to enable hospital clinical engineers to perform "in situ" radiated immunity testing of medical devices inside hospitals.

A second working group is involved with looking for test issues involved with radiated immunity of patient-connected devices.

EIA G-46

John Osburn
RAC Representative

The EIA version of MIL-STD-461/462D, EIA IS (Interim Standard) 647 and 648 completed balloting on 31 January. Of the 80% return of ballots, 60% were affirmative. The IS will be accepted. There are some comments on affirmative ballots to be worked out.

This may be a fruitless exercise. MIL-STD-461D is now classified as an interface standard and can be used (commercially) without problem. MIL-STD-462D is a test specification and a waiver is needed for each application. While the EIA versions can be used, not a lot of opportunity is seen for this. However, EIA will release the newly voted IS.



KIMBALL WILLIAMS
ASSOCIATE EDITOR

Educational Viewpoints

The education of an electrical engineer is usually perceived differently at different stages in the educational process. As I speak to IEEE Student Chapters around the country, I find that most of these students entered their engineering education system with some fundamental misconceptions about what it takes to form the basic education of an electrical engineer. As entering freshman in college, many students believe that their education will comprise a four-year curriculum of classes and laboratory experience, with some required humanities courses that they try to avoid, if possible.

With graduation and entry into the work place, they find that their technical education only partly prepared them for their work, and almost immediately find themselves enrolled in more courses, seminars or workshops to help fill the gaps. It is with some dismay that they find that employers place a significant value on their engineers' ability to communicate (writing, speaking, presenting), much more value than the student would have thought reasonable when trying to avoid those humanities courses in school.

As working engineers encounter more engineering responsibility, we discover that we are forced to return to classes to gain an understanding of project scheduling, cost accounting, team management, personal interactions, leadership, ethics, etc., not to mention the seminars and symposia on new developments in our particular technical field and the related fields with which we must interact. The broadening courses we tried to avoid in school become the sought-after classes for continuing our education.

Role Models

I know that senior high school students entering engineering are told that they need to develop their language skills (speaking and writing) and that these skills form part of the foundation of their engineering education. I know, because I remember the speech when it was given to me....several times! Yet, it never stuck. It was not until I was a working engineer and found myself writing reports, giving presentations and interacting with other engineering team members that it

became obvious just how much value I **SHOULD** have placed on my humanities courses.

I was told. It was true. I ignored it. So did most of my fellow students in college. Oh yes, we took the courses. But, we all knew which courses we should really study hard. We all knew that it was the 'hard' science courses that really mattered. Yeah. Sure.

Somewhere along the way we had all developed a mental model of what an engineer **REALLY** was like. Somewhere along the line we all came to believe that engineers were only required to be accurate, not articulate.

I think that what may have happened was that we formed a mental model of what an engineer is, how he or she is educated and what he or she does. I have seen this model expressed in colleges and universities again and again. It is not a pretty picture. I think we have all seen the stereotype cartoons of the techno-nerd who isn't fit to be seen in public and cannot form coherent sentences. Is this representative of the engineers our schools graduate? I don't think so. Yet, the model persists, and continues to foster a false image of engineers. Why? Could it be that we all bought the image that Hollywood has given us of the engineer as techno-nerd?

False Image

Who do you suppose created this situation? Certainly not the schools. Despite our internal role models and, as students, our tendency to take any course except those that will improve our social skills, our schools still manage to turn out engineers that speak and write well and who work well in team situations.

How many of us working engineers ever take time from our direct job responsibilities to speak to local groups, talk to classes in local schools about what we do and how much fun it is?

No, it is not the schools. But, how many of us working engineers ever take time from our direct job responsibilities to speak to local groups, talk to classes in local schools about what we do and how much fun it is? When a writer finishes a new book, they are immediately sent out on tour to talk to their readers about the book and how much they enjoyed writing it and how much they believe their readers will enjoy reading it.

A painter who finishes a new series of canvases doesn't hide them in a closet, but arranges a showing in a local gallery so that he can meet his public and talk with them about his passion for his work. An actor starring in a new play strives to get interviewed by the local paper to boost interest in attending the play.

How many of our companies finish a new engineering project and then send the engineering team out to speak about the developments, beyond the technical papers they might present at narrowly focused technical symposia?

No, it is not the schools we have to blame for the situation. To quote Walter Kelly, "We have met the enemy, and he is us!"

What To Do

Is it possible to change this erroneous perception of the engineering profession? If we decided that it needs to be done, how can we go about it?

If we work for an aerospace firm, wouldn't it make the flying public feel more secure about the safety of the planes they fly if they can talk with the engineers who are making improvements in the planes on which they will fly? How about the people in the community where you work? Wouldn't they enjoy knowing what goes on in the engineering labs? I know that any time an engineering firm holds an open house, it attracts many visitors from the local community.

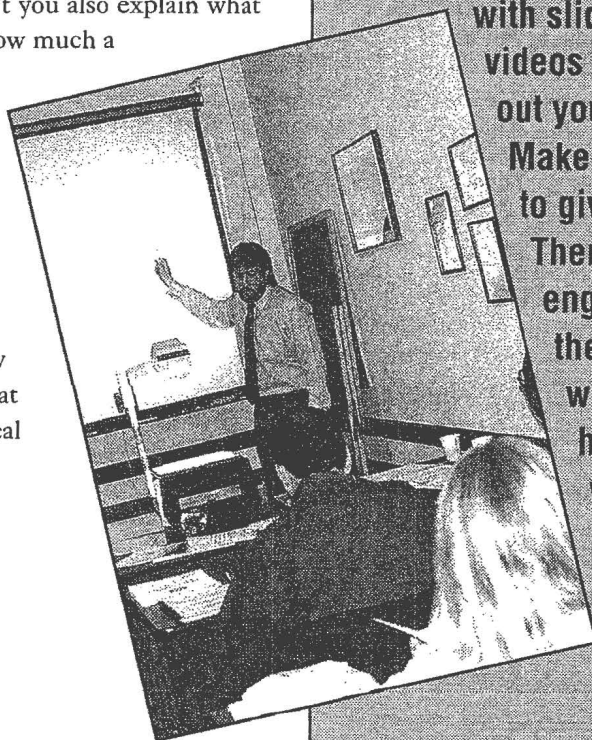
Why not offer to provide speakers to local community groups as well? Surely you can explain what you do in layman's terms. After all, you explain it to your managers. And your managers explain it to the company's stockholders! If you can explain what you do in simple terms, couldn't you also explain what you do to a high school physics or math class? Think how much a young student might benefit from a short presentation that demonstrated the use of some of the math and science they have been studying so long.

A technical paper that you gave to a society meeting last year could be re-done for a local group of citizens and perhaps reflect the excitement you felt as you were developing the concepts. If you think back, the speakers that let their enjoyment of their work show through in their presentation were probably the ones that you most enjoyed. Just tone down the math and technical jargon to fit the audience.

MAKE A DIFFERENCE

If each engineer gives only one talk to a student or community group each year, over time we will touch everyone on the planet with our joy in our work. We can change the role model for engineers from the bumbling, mumbling techno-nerd to a concerned and responsible worker toward positive change. We can do it!

The EMCS Education Committee wants to help you to make that difference. Our Lecture and Outline Subcommittee is prepared with a generic talk outline, and later this year will be ready to help with slides and videos to help fill out your talk. Make your plans to give that talk. There is a future engineer out there who is waiting to hear from you!



Book Review

COMPUTATIONAL ELECTRODYNAMICS: THE FINITE-DIFFERENCE TIME-DOMAIN METHOD

By Allen Taflove

Artech House
Boston, 1995
599 pages

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Computational Electrodynamics: The Finite-Difference Time-Domain is written by a pioneer and leading contributor to the theory and application of this robust numerical method. In the preface to the book, Taflove briefly recounts with enthusiasm his discovery of Kane Yee's original paper, and the possibilities he envisioned for this numerical technique that has become known as the finite-difference time-domain method (FDTD). In the ensuing twenty-plus years, Taflove's contributions to the development of FDTD for electromagnetic field interactions reflect this same enthusiasm and single-minded belief in the possibilities for wide application of the method. This well-written book retains that spirit of enthusiasm in laying out the fundamentals of FDTD and present "state of the art," while implicitly looking to future untapped applications of FDTD.

The advent of powerful and affordable desktop computers has led to numerous applications of FDTD in many diverse areas of electromagnetics since the late 1980's, including EMC. A recent selective review of the FDTD literature by Schlager and Schneider [IEEE Antennas and Prop. Mag., Vol. 37, pp. 39-57, Aug. 1995] containing over 300 references, indicates that the number of FDTD articles appearing in the literature grew from a mere handful in 1985 to over 200 articles published in 1994. This method is being applied in RCS, antennas, microwave circuits, high-speed digital circuits, EMC, and optics, as well as new areas such as particle accelerator physics and integrated printed circuit and device modeling. FDTD is theoretically straightforward and remarkably robust, however, there are many details to master prior to successfully implementing the method for modeling

commercially available FDTD codes, but modeling specific problems requires an understanding of the fundamentals and the limitations of the method. This book provides a good background.

The book has sixteen chapters, some relatively short. It is well organized into two sections, although there are no specific section designations. The first section, comprising Chapters 1 to 7, details the fundamentals of FDTD, and begins building from very basic principles and concepts. The development begins simply with a scalar wave equation, continuing into the 3D Yee algorithm, stability, numerical dispersion, source implementation, and absorbing boundary conditions. The second section, Chapters 8 to 16, covers more specialized topics including near-to-far-field transformation, dispersive and nonlinear materials, subcellular methods, unstructured grids, bodies of revolution, high-speed digital circuit modeling, antennas, RCS and complex wave scattering, and FDTD algorithms for vector and multiprocessor computers. Chapters 1 to 10 and 15 were written by Taflove, and the remaining chapters were contributed by several former students of Taflove, and other colleagues. The writing is well-organized, clear, and concise.

The first section on FDTD fundamentals is sufficiently clear and complete that a student or professional new to the area could confidently write a 3D FDTD code after completing a study of these chapters without the aid of additional reading materials. Chapter 1 is an overview of the development of FDTD, and a perspective on where differential-equation based techniques, and in particular FDTD, fit into the larger picture of computational electromagnetics.

Chapter 2 begins the development of the FDTD method with the one-dimensional scalar wave equation. Finite differences are discussed, and the second order accuracy of the discretized scalar wave equation with central differences is shown. The numerical dispersion relation for the 1D scalar wave equation is derived, and numerical phase velocity investigated. The chapter concludes with a development of numerical stability for the 1D algorithm. This short introductory chapter lays out in a simple manner the basic considerations in numerically pursuing a second-order accurate time-marching solution to the wave equation. The treatment of topics in Chapter 1 is very balanced between underlying theoretical details, and the

The advent of powerful and affordable desktop computers has led to numerous applications of FDTD in many diverse areas of electromagnetics, including EMC.

complex problems. This book does a wonderful job of laying out the theory and practical implementation of FDTD in a clear and concise manner. It is an essential text for a newcomer learning FDTD, as well as a valuable reference for a more experienced practitioner. The book serves well as a teaching text, and for a professional pursuing a self-study of FDTD. There are

operational mechanics of obtaining an update equation for the independent variable that can be immediately implemented in code. With only a few exceptions, this balance is achieved throughout the text.

The 3D FDTD algorithm on a rectangular grid, or Yee algorithm, is introduced in Chapter 3. A good qualitative description of the Yee algorithm is presented that provides the reader with some insight into the salient features of the method. The basic finite-difference equations for the six independent field components are developed from the source-free Maxwell's equations in differential form for a general medium, and the distribution of the components over the Yee cell discussed. It would have been helpful if the development at this stage had included impressed source terms. These details, however, are contained in a later section.

A section interpreting FDTD in terms of the integral forms of Ampere's and Faraday's law is provided as well. This section is very helpful for those learning FDTD because it relates the algorithm to the physics of Maxwell's equations contained in the circulation and flux integrals. For EMC engineers, this is particularly insightful, since the integral forms of Maxwell's equations are qualitatively applied in diagnosing many EMC problems related to coupling through the E and H fields. The insight provided from the integral form is essential, because the application of boundary conditions at material interfaces and many subcellular methods are developed from the contour integral interpretation.

Chapters 4 and 5 are short chapters detailing numerical stability and dispersion, respectively, for the Yee algorithm. A rigorous treatment of stability is presented in two dimensions, and generalized to 3D. The author is careful to point out that while the basic algorithm is stable for appropriate choice of time-step, perturbing the algorithm by introducing approximate absorbing boundary conditions, subcellular approximations (e.g. wires, slots, lumped elements), variable meshing, or boundary fitting approximations can potentially introduce instabilities. Chapter 5

develops the numerical dispersion relation for the Yee algorithm. Examples of the phase velocity for varying mesh dimensions and angle of wave propagation through the mesh are given. An example that lends insight into how fast phase errors can collect is given.

Implementation of sources in free-space and waveguides is discussed in Chapter 6. The chapter focuses primarily on the total-field/scattered-field formulation for implementing a source. The computational domain is divided into a total- and scattered-field regions, and the source implemented via a connection scheme across the boundary. While the approach is general, it is most easily employed with plane-wave excitations. The algorithm is developed in careful detail in two dimensions and update equations are given. Extension is made to 3D, with the relevant time-marching equations provided. While the algorithm can get confusing, the text and figures provide good direction. A broader discussion of sources and source modeling would have been helpful, e.g., impressed or soft sources, voltage and current sources, antenna source models, and sources for printed circuits that are in general more useful for EMC applications.

Absorbing boundary conditions (ABCs) for truncating the computational domain in open region problems are treated in Chapter 7. The discussion proceeds roughly from a historical perspective including Bayliss-Turkel annihilators, and Enquist-Majda one-way wave equations (leading to the usual second-order Mur ABC). Brief discussions of the Higdon operator, Liao ABCs, and Mei-Fang superabsorption are also given. The chapter concludes with a discussion of the Berrenger perfectly matched layer (PML) ABC in free-space and waveguides. The treatment follows that given by Berrenger in his original work, and retains the same notation. The theory is well-developed. However, this is one of the few sections of the book that is lacking in implementation details. In particular, it would have been helpful to discuss the manner in

which the six components from the free-space region progress into twelve components in the PML region.

Two formulations of FDTD modeling of dispersive materials are presented, recursive convolution (RC) and auxiliary differential equation (ADE) methods.

Further, the specific lossy material components in the PML that are employed for the termination of a given plane in the computational domain. Neither of these details is complicated, but can take some time to discern. PMLs are an area of considerable current investigation, and a number of important papers have appeared in the literature since the publication of this book. PMLs are of critical importance in many EMC and "lower-frequency" applications where the geometry scales are often a fraction of a wavelength. The white space needed for implementing other ABCs can become prohibitive.

More specialized applications of FDTD are contained in Chapters 8 to 16. Chapter 8 details two near-to-far-field transformations for FDTD. Chapter 9 discusses FDTD modeling of dispersive, nonlinear, and gain materials. Two formulations of FDTD modeling of dispersive materials are presented, recursive convolution (RC) and auxiliary differential equation (ADE) methods. The RC method is treated for Debye and Lorentzian materials as well as for a linear gyrotropic medium. The necessary fundamentals are discussed, and explicit time-marching equations are given for both total- and scattered-field formulations. The ADE method is motivated with a simple 1D example, and the ADE's and associated time-marching equations are given for first- and second-order materials. Results are presented for second-order materials with single and multiple resonances. Overall the reader is left with some feeling for the trade-offs between the two methods, the computational efficiency of the RC approach, and the robustness of the ADE method. Good discussions of the ADE method applied to nonlinear optics and gain media (lasing) are also presented.

Among the most attractive features of FDTD is the potential for modeling small features relative to the mesh dimension without meshing down to the small scale. Subcellular methods for modeling a limited class of slots, boundary fitting, thin wires, thin material sheets, and a dispersive surface impedance are discussed in Chapter 10. Methods for modeling voltage sources and lumped elements at the cell level are treated in a later chapter. The subcellular methods presented are based primarily on the contour path interpretation of the FDTD algorithm that is described in Chapter 3. An algorithm for thin slots with depth is presented, as well as thin wires, and conformal modeling of curved sheets. Sufficient details are provided for the underlying principles and approximations, as well as for readily implementing these algorithms. Good discussions of thin-material sheets and dispersive surface impedance boundary conditions are also given. The chapter concludes with a brief note of caution regarding stability when introducing subcellular algorithms. It is difficult to provide even a cursory treatment of the most significant work done in FDTD subcellular methods in the limited space of one chapter, and some significant developments were necessarily omitted. However, a good list of additional references are provided at the end of the chapter.

Chapter 11 on FDTD for nonorthogonal and unstructured grids was contributed by Gedney and Lansing. This chapter discusses tensor-based nonorthogonal FDTD and discrete surface integral (DSI) based FDTD methods. A brief discussion of FDTD on nonuniform orthogonal grids with examples is also given. Necessary tensor algebra is presented, the nonorthogonal FDTD method for a general curvilinear space and oblique space are given, and stability is discussed. The DSI-based FDTD algorithm is also discussed. This algorithm, while significantly more difficult to implement than the tensor-based algorithm, has the advantage that it is very general and suitable for unstructured meshes, and allows for a

great deal of modeling flexibility. A fundamental challenge with this algorithm is that the edge vectors in the primary and secondary meshes (E- and H-field) are not orthogonal to the face of its dual. As a result, vector reconstruction and projection steps are necessary in the leapfrogging algorithm. Conceptually the problem is not difficult, but the details of implementing the algorithm are complex. While this section is well-written, implementing the DSI-based algorithm requires many details that could not be included in the scope of the book. Several modeling examples and results are given, as is a picture of an unstructured mesh for a power divider that illustrates the modeling flexibility of this approach.

The body of revolution algorithm for FDTD, contributed by Jergens and Saewert, is detailed in Chapter 12. The treatment is thorough and sufficient details are given to readily implement this algorithm. Chapter 13 is contributed by Picket-May together with Taflov and focuses on modeling high-speed digital circuits. This chapter contains several FDTD topics applied to printed circuits, including discussions on impedance and lumped element parameter extraction, signal processing and spectrum estimation techniques (Prony's method and autoregressive models). A good treatment of lumped element modeling is also presented for resistors, capacitors, inductors, voltage sources with source resistance, diodes and transistors. A short section showing that FDTD can be linked with SPICE is also provided. However, there are no details as to accomplishing this. This work is relatively recent, and, hopefully more details will appear soon in the literature.

Chapter 14, contributed by E. Thiele, presents applications of FDTD

to antenna analysis. The chapter focuses primarily on two examples, a monopole over ground and a Vivaldi array. The chapter gives the reader an idea of the potential of FDTD for antenna analysis. Antenna applications of FDTD continue to be a challenging area of research. Among the difficulties, which are also very relevant for EMC applications, are the widely varying scales of the problem between the feed geometry and the gross antenna conductors. Accurate input impedance calculations require the feed geometry to be modeled well. However, the number of unknowns in the problem can grow quickly. One example (far-field results) given for a single Vivaldi element employed 4.2 million unknowns and a Cray Y-MP for the solution.

Chapter 15 discusses RCS, enclosure penetration and coupling, and biological applications of FDTD. Much of the chapter is from early work in FDTD. The final chapter contributed by Gedney and Barnard is on FDTD algorithms for vector and parallel computers. This chapter gives a brief overview of the essential elements of vector and parallel processing, and the implications for FDTD. Specific FDTD examples are used in both cases that provide the reader with good direction. A parallel algorithm for FDTD on an unstructured mesh is also considered, and several domain decomposition algorithms for parceling the computational load among processors are discussed.

Overall I felt this was an excellent book that is useful as a course text or for self-study. The book is logically organized, well-written, and does a thorough job of presenting the fundamentals of FDTD from underlying theory to implementation details. The material throughout is well-referenced. Many choices were made on the material to include in the applications chapters, and much of it was from the work of Taflov and his students. However, I felt that other important work was well treated, and overall the text was scholarly.

Among the most attractive features of FDTD is the potential for modeling small features relative to the mesh dimension without meshing down to the small scale.

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WILLIAM G. DUFF
ASSOCIATE EDITOR

Bill Kimmel is cofounder and co-owner of Kimmel Gerke Associates, Ltd., a leading EMC consulting firm based in St. Paul, Minnesota. They specialize in design, troubleshooting, and training on EMC and related issues. The business encompasses a variety of business areas, including military, vehicular, industrial, commercial, and telecom.

Bill and his partner, Daryl Gerke, started teaching electronics part-time in 1978 for a technical college, and soon began consulting on curriculum development. When the FCC Part 15 regulations were enacted in 1982, Bill began to apply EMC expertise to industry on a consulting basis. This expanded to become a full-time practice in 1987.

Bill is widely published on various EMC subjects, being a regular contributor to the *Electromagnetic News Report (ENR)* and *Medical Device and Diagnostic Industry*. He is coauthor of "Electromagnetic Compatibility in Medical Equipment," a book jointly published by the Interpharm Press and IEEE Press (1995). He is well-known around the U.S. as a lecturer and consultant on EMC.

Bill is past chair of the Twin Cities EMC Society and currently serves on Subcommittee 8 of Standards Committee C63, EMC Testing Standards for Electromedical Devices (EMD). Previously, he served three years as co-editor of the *IEEE Twin Cities Section Newsletter* and three years as IEEE Twin Cities Section Student Activities Chair.

Bill served in numerous EMC related engineering and management positions with Control Data Corporation (now Ceridian) and Sperry Defense Systems (now part of Lockheed). Over the years, he has worked in analog design, logic design, magnetic memory design, and systems design.

Bill got his first exposure to EMC while working on design and instrumentation and equipment design for nuclear radiation effects (neutron, gamma and EMP) in the mid-sixties when underground nuclear testing was still permitted. It was here that he learned that radiation hardening involved good EMI design practices: since neither gamma radiation nor neutrons can be effectively shielded, he had to apply good EMC circuit and circuit board design techniques to cope with the problem. Subsequently, he had the opportunity to apply those EMC design practices to magnetic memory design, TEMPEST design and systems design of military products.

Bill earned a Bachelor's Degree with distinction in electrical engineering from the University of Minnesota in 1962. He is a registered Professional Engineer in Minnesota, a NARTE Certified EMC Engineer, and a NARTE Certified ESD Engineer.

Bill and his wife Sharon live in West St. Paul, Minnesota. Their kids are now out of college and out of the house. Their home is close to the Minneapolis/St. Paul Airport, which is a decided advantage when coping with the often hectic travel schedule of a consultant. In his spare time, Bill likes to read (good for airplane time), swim, walk and bicycle.



BILL KIMMEL

Bill got his first exposure to EMC while working on design and instrumentation and equipment design for nuclear radiation effects in the mid-sixties when underground nuclear testing was still permitted. It was here that he learned that radiation hardening involved good EMI design practices.

TAB Public Relations Committee Report

HAROLD S. GOLDBERG,
CHAIR, TAB PUBLIC RELATIONS COMMITTEE

The following was excerpted from a sharing activity letter. For more information or to share information about your activities, contact Mr. Goldberg at IEEE headquarters.

Shuichi Nitta, Chair of the Tokyo Section Reliability Chapter discussed opportunities for information exchanges both inside and outside Japan (in his case) through the IEEE. He was appreciative of a talk by Paul Gottfried of the USA on Reliability and Safety Issues of Train Control. His other speakers came mainly from Japan. As are other Chapters, he is concerned about finances.

A success story in the development of the Computer Chapter of the New Jersey Coast Section is described by Amruthur Narasimhan, Chapter Chair. With the help of a loan from their Section, the Chapter sponsored a Professional Development Seminar for students on Multimedia Communications. They hoped for more than 20 attendees and attracted over 100 - a sellout. He advises advertising in every way possible.

Cleveland's Vehicular Technology (VT) Chapter is riding on several good years of four or more programs per year. Michael Garvey, Chapter chair notes that tours are very popular with the members.

An inspiring report was received from Elya Joffe, Chairman of Israel's Electromagnetic Compatibility (EMC) Chapter. This is a new Chapter, only two years old, with 40 members. They not only held several lectures last year but they proposed, and had accepted by the EMC Society, the sponsorship of the International Symposium on EMC in Israel in the year 2003. The Chapter is already starting to work on this event. Elya is issuing an invitation to EMC members in the area, including all Palestinians, Jordanians, Egyptians, and as he says it, "Hopefully, very soon all the neighboring countries," to contact the Israeli Chapter to contribute to the success of the Symposium, the first to take place in the Middle East.

From the Ukraine comes a story by Alexander Nosich on the formation of an Antennas and Propagation (AP) Chapter in spite of "life being really hard in this country, especially for engineers and scientists. Institution budgets are zero or even negative, the industry is frozen and a simple postal letter to USA is not affordable for the majority of the population." Yet, as documented in the AP magazine June 1995 issue, the Chapter was formed and is organizing a conference on Antenna Theory and Techniques.

Congratulations. Let's hope there can be some visits and funding for them soon.

We received a request from Jim Ziobro of the Rochester Section. He heads the Information Committee and would like to move to electronic access. He would like to develop an electronic network with others of the same mind. The e-mail alias is eic-tech@ieee.rochester.ny.us

From Hussein bin Ahmid of the Power Engineering Chapter, Malaysia Section, we hear that in the absence of an EMC Chapter there, the Power Engineering Chapter organized a conference on Electromagnetic Compatibility last year. "Healthy and Quality Environmental Through EMC" was the topic with about 80 participants. Papers were received from almost 15 countries around the world. Let's hope it promoted the development of an EMC Chapter as well.

The German Chapter of MTT has concentrated on a series of conferences and workshops throughout Germany. This is a wonderful method of attracting members from a diverse Chapter where constant commuting to a single location could be bothersome.

Heirman Honored



Donald N. Heirman has been named a recipient of the 1997 IEEE Charles Proteus Steinmetz Award with the citation: "For contributions and leadership in developing electromagnetic compatibility standards."

The IEEE Charles Proteus Steinmetz Award was established by the IEEE Board of Directors in 1979 and is presented for major contributions to the development of standards in the field of electrical and electronics engineering. The prize consists of a bronze medal, certificate and \$5000. The award is administered through the IEEE Awards Board and is sponsored by the IEEE Standards Board. Congratulations, Don!

IN REMEMBRANCE

L. Gilda Haskins-McMahon



L. Gilda Haskins-McMahon

died on Tuesday, May 28, 1996 after a three-year battle with breast cancer. Her memorial service was held on Saturday, June 15, in Chalfont, PA. Gilda was born in Norristown, PA on March 9, 1949, and was the daughter of the late John F. Haskins and Lucia Gilda Santucci. She was the wife of Michael J. McMahon and mother of Patrick. Surviving besides her husband and son are three stepchildren, Jennifer McMahon, Brenden McMahon, and Kathleen McMahon, all of Philadelphia; three brothers, John (Jack) Haskins of West Chester, Harry Haskins of Alexandria, VA, and Michael Haskins of Jacksonville, FL; and three sisters, Kathleen Haskins of Jacksonville, FL, Philomina Karol of Raleigh, NC, and Isabelle Graf of Palantine, IL.

Gilda's hobbies included wine tasting, organizing Easter egg hunts associated with her church, and actively participating in the Cystic Fibrosis Foundation. This program was especially important to her since her son Patrick has cystic fibrosis. Anyone interested in contributing funds in her name to the Cystic Fibrosis Foundation, can send contributions to the foundation at 1601 Market Street, Suite 2210, Philadelphia, PA 19103.

Gilda graduated from Drexel University in 1971 with a B.S. in Physics. She continued her education in Engineering Science at Pennsylvania State University where she received an

MS in Engineering. She did additional post graduate work at George Washington University where she studied Electromagnetic Compatibility.

Early in Gilda's engineering career, she participated in the Naval Material Command Tactical Electromagnetic Systems Study Action Council (TESSAC) which prepared plans to define the requirements and resources to control electromagnetic environmental effects (E^3) during the acquisition process for Naval Airborne weapons systems. She investigated EMI problems on various Naval aircraft systems and recommended priorities for resolution of problems for the Naval Air Warfare Center (NAWC). She was responsible for the performance of technical tasks under the NAWC contract on Air Systems Electromagnetic Interference Corrective Action Program (ASEMICAP). Gilda was also the lead engineer in the initial design and development of what is now the ASEMICAP Management Information Tracking System (AMITS).

Gilda was a NARTE-certified EMC engineer. She was a senior member of the EMC Society, and Secretary for the 1991 IEEE International Symposium Committee. She served as Chairwoman, Vice Chairwoman, and Secretary for the Philadelphia Chapter of the IEEE EMC Society. It was through her dedication and hard work that Gilda became a highly respected engineer within the EMC community. Gilda was always available to assume any engineering task that was given to her. She set an example and became a role model as a very capable and qualified EMC engineer for subsequent newcomers who entered the EMC community. She will be missed by all who knew her.

— Mike Daniele

James C. Parker

James (Jim) C. Parker died suddenly of a heart attack on Saturday, June 29. He is survived by his wife, Rosanne, and daughter Melissa.

A highly respected member of the IEEE EMC Society and an active member of the IEEE EMC Standards Committee, he served as chairman of TC-4 on EMI Control.

Jim began his career in EMC at the University of Michigan, where he majored in electrical engineering. Jim earned his Ph.D. from the University of Michigan in 1970. He was a senior member of the IEEE, the ESD Association, Sigma Xi, Phi Kappa Phi, Eta Kappa Nu and Triangle. A registered Professional Engineer in Electrical Engineering, he was a member of the Santa Clara University Electrical Engineering Board.

Jim worked for many companies over the course of his career, including Fujitsu Computer Packaging Technologies, Apollo Computer, Data General Corporation, Bell Laboratories and Conduccion Corporation. Most recently, he was a senior staff engineer at Sun Microsystems in Mountain View, CA.

He was the author of many articles and publications on EMC and a frequent presenter at EMC symposia. He was the Chairman of a Technical Papers Session and/or Technical Committee at the annual IEEE EMC Symposium every year since 1985. He held a patent for an improved foreshortened log-periodic antenna, and one is pending for superdirective antenna designs.

In his spare time Jim was an amateur radio operator and enjoyed flying his small plane.

Call for Papers

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THE APPLIED COMPUTATIONAL ELECTROMAGNETICS SOCIETY

**Announces a Call for Papers for The 13th Annual
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March 17-21, 1997

Naval Postgraduate School, Monterey, California

The purpose of the Symposium is to bring analysts together to share information and experience about the practical application of EM analysis using computational methods. The Symposium offerings include technical presentations, demonstrations, vendor booths and short courses. All aspects of electromagnetic computational analysis are represented. Contact Eric Michielssen for details and a complete Call for Papers.

Papers may address general issues in applied computational electromagnetics, or may focus on specific applications, techniques, codes, or computational issues of potential interest to the Applied Computational Electromagnetics Society membership.

INSTRUCTIONS FOR AUTHORS AND TIMETABLE

For both the summary and final paper, please supply the following data for the principal author: name, address, Email address, FAX, and phone numbers for both work and home.

October 25, 1996:

Submission deadline. Submit four copies of a 300-500 word summary to the Technical Program Chairman.

November 25, 1996:

Authors notified of acceptance.

January 10, 1997:

Submission deadline for camera-ready copy. The recommended paper length is 6 pages, with 8 pages as a maximum, including figures.

The registration fee per person for the Symposium will be approximately \$235. The exact fee will be announced at a later date.

1995 EMC Society Member Survey Second Report

BY
DANIEL HOOLIHAN
VICE-PRESIDENT, EMCS

A number of questions in the survey were "open-ended"; that is, they were a blank space to be filled in as per the respondent's desire.

One open-ended question of interest was "Would you be willing to pay increased Society dues for increased services?" Thirty-two percent (32%) of the people said no, 22% said yes, and 46% said they "can't say." Of the 22% that said yes, 32 respondents were interested in EMC short courses and videotapes, 12 respondents wanted more coverage of EMC standards, and 11 people wanted increased CD ROM or Internet services. Five people wanted an increase in the Transactions pages and four people wanted employment and consulting services.

In reply to the question, "Why did you join the EMC Society?", 50% of the

respondents stated they wanted "to keep abreast of new EMC developments" and 30% pointed to "EMC professional need including networking with other EMC members." Thirty people (6% of the survey respondents) joined in order to have a copy of the IEEE Transactions, while only 1% joined in order to get a copy of the EMC Society Symposium Proceedings.

In analyzing the answers to the open-ended question, "What do you find most outstanding about the annual EMC Symposium?", we have to remember that only 11% had attended the 1994 symposium and only 14% had planned on attending the 1995 symposium. Their reasons for attending ranged from quality of technical presentations (52%), exchanging current technical information (29%), innovative exhibitions and workshops (7%) and a copy of the proceedings (2%).

When asked about the *Transactions* (What do you find most outstanding about the EMC Society Transactions?), the "quality of the in-depth technical papers" was the number-one response with 46% of the responses agreeing. Then, about 18% of the respondents liked the *Transactions* when they included "practical up-to-date papers" and 14% liked the "variety of the applications."

EMC Society Newsletter

Thirty-eight percent (38%) of the survey responses were in agreement that "general interest information including chapter chatter & society activities" was the most outstanding feature of the *EMC Society Newsletter*. Book reviews were the second most outstanding feature of the newsletter (14%), followed by "standards update" at 10%.

The "abstracts" were also quoted by 10% of the respondents as "outstanding" while reports from the education committee garnered a 5% rating. The President's Column was well-liked and respected by 5% of the survey. The enthusiasm of the President was especially noted by a number of members.

In a separate question, there were suggestions for changes in the Newsletter including less small talk, more practical tips and information/general papers, more small articles on new emerging technologies, more theory/technique articles, more information on new standards and additional tutorial articles.

When asked the question "Which EMC standards should the EMCS be

THE 1995 STATISTICAL MEMBER SURVEY

Second Report

This is the second report on the statistical member survey performed in 1995 on the entire membership of the EMC Society. The first article on this survey (See the Spring issue of the *IEEE EMC Society Newsletter*) concentrated on the overall statistics of the survey including graphical analyses of base salaries, years of membership, and types of current employment. These tables are reprinted because the keys to the plots were transposed in the first article.

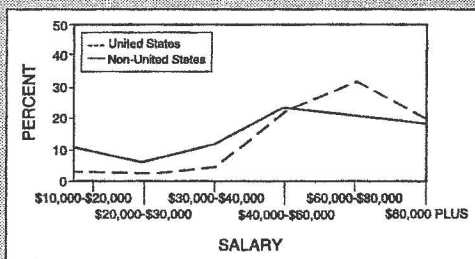


Table 1. Present Annual Base Salary — United States and Non-United States.

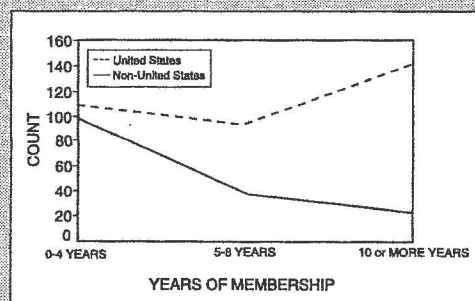


Table 2. Years of Membership in EMCS.

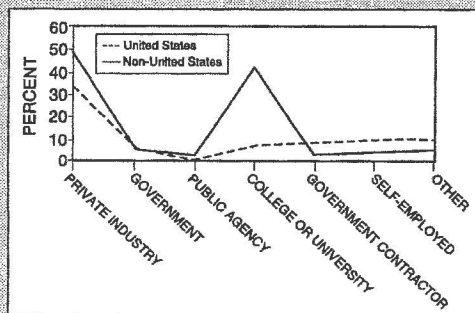


Table 3. Types of Current Employment.

sponsoring in the future?", 23% responded that we should be trying to "harmonize standards." Another 9% thought that the EMCS should be concentrating on military standards, while another 9% thought the EMCS should be looking at all "worldwide regulatory standards." There were over fifty other suggested EMC standard ideas including CISPR standards, test standards, medical device standards, PCS immunity, vehicle EMC, EMC best practical services, radiated electromagnetic fields and their biological effects, and lightning.

With respect to the EMC Society's educational efforts, 17% of the respondents favored more emphasis on tutorials, self-study courses, lower-level technical information, and EMCS sponsored books. However, 10% thought that more attention was needed in the area of advanced measurements, including standardization of measurement techniques. About 6% thought that local courses and local access to training needed improvement. (This is a good opportunity for local chapters to sponsor more workshops to fill this need!) There were approximately 50 other ideas suggested by anywhere from 1 to 5 people!

In reply to the question, "Would you be interested in attending regional seminars on various standards-related topics sponsored by the EMC Society?", the most popular answer was military EMC Standards (3 people). This was followed by two people who agreed that they were interested in "the relationship between international and Euro standards" and two more people were "struck with" the idea of lightning and EMP. There were 18 other ideas suggested by individual respondents.

This completes about half of the open-ended questions in the survey. The remaining questions will be addressed in the next newsletter. Questions or comments on this article should be addressed to Dan Hoolihan at 612-638-0250 or 612-638-0285 (FAX) or E-mail at dhoolihan@tuvps.com



WILLIAM H. MCGINNIS
ASSOCIATE EDITOR

Following are abstracts of papers from previous EMC symposia, other conference meetings and publications.

EMCAB COMMITTEE

Mike Crawford, Consultant
Bob Hunter, Consultant
Prof. Fujiwara, Nagoya Inst. of Technology
Sha Fei, EMC Research Section,
N. Jiatong Univ., Beijing, China
Ferdy Mayer, L.E.A.D., Maisons, Alfort, France
Perry Wilson, EMC Baden, Ltd., Switzerland
Heinrich Gahr, Austrian Research Center

"HOW CAN I GET A COPY OF AN ABSTRACTED ARTICLE?"

Engineering college/university libraries, public libraries, company or corporate libraries, National Technical Information Services (NTIS), or the Defense Technical Information Center (DTIC) are all possible sources for copies of abstracted articles or papers. If the library you visit does not own the source document, the librarian can probably request the material or a copy from another library through interlibrary loan, or for a small fee, order it from NTIS or DTIC. Recently it became clear that EMCABs were more timely than publications which were being listed in data files. Therefore, additional information will be included, when available, to assist in obtaining desired articles or papers. Examples are: IEEE, SAE, ISBN, and Library of Congress identification numbers.

Also, the steering staffs of the Japan Technical Group and the EMC / Tokyu chapter have offered to act as a central point for requests of papers abstracted here. Most of the papers will be available in Japanese only. Abstracts of papers from EMC-J will be clearly identified. The steering staff will assist in routing your request to the author(s) but will not translate the papers. The contact person is Professor Osamu Fujiwara, Department of Electrical and Computer Engineering, Nagoya Institute of Technology, Gokiso-cho, Showa-ku, Nagoya 466, Japan; e-mail: fujiwara@odin.electomech.nitech.ac.jp

Some of the Chinese papers are not available in English. Associate Professor Sha Fei, EMC Research Section, Northern Jiatong University, has offered his time and assistance in routing requests for papers to the appropriate author(s). He is not furnishing a translation service.

As the EMC Society becomes more international, we will be adding additional worldwide abstractors who will be reviewing articles and papers in many languages. We will continue to set up these informal cooperation networks to assist members in getting the information or contacting the author(s). The library at Southwest Research Institute, 6220 Culebra Road, San Antonio, Texas, 78228-0510 has agreed to catalog, shelve, and have available for interlibrary loans proceedings from symposia and meetings which are donated to the library. Any such donations can be sent to me at the above address and I will review them for suitable articles and then forward them to the SWRI library. We are particularly interested in symposium proceedings which have not been available for review in the past. Thank you for any assistance you can give to expand the EMCS knowledge base.

EMI: A SILENT THREAT TO THE COMBAT CASUALTY CARE MEDICAL ELECTRONIC SYSTEMS**EMCABS: 01-08-96**

Dr. M.A. Mohd (1) & Maj. C.L. Linden, Jr. (2)
(1) USAF WLAD, Eglin AFB, FL & (2) WRAIR, Div. of Surgery, Washington, DC
Proceedings of the Reverberation Chamber and Anechoic Chamber Operators Group Meeting,
Naval Surface Warfare Center, Dahlgren Division, Dahlgren, VA 22448-5100
NSWCDD/MP-96/38, March 1996, pp- 395-408

Abstract: High power electromagnetic systems are an integral part of modern battlefields and electromagnetic interference (EMI) is the byproduct of such systems. This paper promotes the awareness of the severity of the EM Environment in the modern battlefield and its impact on medical electronics performance. This paper concludes that the use of high technology to minimize the battlefield delays and maximize the availability of the "Golden Hour" would become ineffective unless the high technology systems are designed for electromagnetic compatibility (EMC).

Index terms: Medical electronics vulnerability, high power electromagnetics, electromagnetic environment

ON THE PENETRATION OF MAGNETIC TRANSVERSE AND LONGITUDINAL FIELDS IN A PERMEABLE AND CONDUCTING SLOT**EMCABS: 04-08-96**

E. Baum and G. Mrozynski
University of Paderborn, EE Dept. 14/900, Warburger Str. 100, 33098 Paderborn, Germany
1994 International Symposium on EMC, ISEMC 94 Proceedings, pp.188-193. December 5-9, 1994,
Rebouças Convention Center, São Paulo, Brazil

Abstract: The decay constant of a transverse low impedance magnetic field in a permeable and conducting slot is first determined by a static field solution. The comparison with a solution that refers to the complete set of Maxwell's equations shows that the static solution can lead to far too high values for the decay constant. For longitudinal fields, the static solution yields lower and upper limits for the decay constants. Numerical examples are given.

Index terms: EMC-analysis, grounding/shielding

DIPOLE EXCITATION OF RF SHIELDED CHAMBER**EMCABS: 02-08-96**

S.V.K. Shastry, S.K. Nugesh and M.N. Rao
ISRO Satellite Centre, Bangalore
Proceedings of the 1995 International Conference on EMI and EMC (INCEMIC),
Madras, India, December 6 - 8, 1995, pp. 230-236

Abstract: The electric field due to Hertzian dipole in RF shielded anechoic chamber of cuboidal geometry is analyzed using the dynamic Green's function. The obtained expressions are used in the computation of field strength at various points within the chamber. The results may be used to map fields.

Index terms: anechoic chamber, Hertzian dipole, field distribution

RESONANCE CHARACTERISTICS OF INDIRECT ESD FIELDS**EMCABS: 05-08-96**

Hiroiyuki Iwata and Yasuo Akao
Aichi Institute of Technology, Yakusa, Toyota-shi, Aichi, 47003, JAPAN
1994 International Symposium on EMC, ISEMC 94 Proceedings, pp. 209-214
December 5-9, 1994, Rebouças Convention Center, São Paulo, Brazil

Abstract: In the immunity tests for electrostatic discharge, the method of contact discharge to a metallic plate is recommended. This paper presents characteristics of fields generated by the metallic plate. The time-domain responses of fields were observed with a broadband time-domain antenna and a digitizing oscilloscope. The paper reports the frequency responses in the decaying term of the later part of the time-domain waveform while varying the plate size.

Index terms: ESD, measurements

CHARACTERIZATION OF THE ELECTROMAGNETIC EMISSIONS FROM CELLULAR TELEPHONY RADIO-BASE STATIONS REGARDING SAFETY**EMCABS: 03-08-96**

Victor Vellano Neto TYELEBRAS/CPqD and ABRICEM
Brazil International Symposium on EMC, ISEMC 94 Proceedings, pp.158-163
December 5-9, 1994, Rebouças Convention Center, São Paulo SP Brazil

Abstract: Despite the low level of power emitted by the Radio-Base Stations (RBS) of the cellular telephony systems in use in the country, the proximity of their antennas to residences and buildings in some installations raised concerns of some of their neighbors regarding the possible health effects from their emissions. The measurements described are part of a survey carried out to assess the level of electromagnetic emissions that the residents were subjected to from the Radio-Base Stations.

Index terms: Bio-effects, RF measurements

CONTROLLING THE PROCESS OF EMI/EMC MEASUREMENTS BY USING TAGUCHI METHODS**EMCABS: 06-08-96**

Benjamin S.M.C. Galvão and Geilson Loureiro
Brazilian Institute for Space Research (INPE), Integration and Testing Laboratory (LIT)
1994 International Symposium on EMC, ISEMC 94 Proceedings, pp. 230-235
December 5-9, 1994, Rebouças Convention Center, São Paulo, Brazil

Abstract: This paper presents a study related to the repeatability of Electromagnetic Interference and Compatibility (EMI/EMC) measurements. It lists the factors related to each type of EMI/EMC test. Then a method to design experiments, based on Taguchi techniques, is proposed. This method explains how each factor contributes to errors in measurements, how these errors could be controlled and how the uncertainties in measurements might be calculated. An example of the method application is presented.

Index terms: measurement techniques, error reduction

ELECTROMAGNETIC FIELD COUPLING TO IMPERFECT SHIELDED CABLES**EMCABS: 07-08-96**

M. Ianoz, F. Rachidi, P. Zwiackner
 Laboratoire de Réseaux d'Energie Électrique, Swiss Federal Institute of
 Technology, CH-1015 Lausanne, Switzerland
 1994 International Symposium on EMC, ISEMC 94 Proceedings, pp. 253-258
 December 5-9, 1994, Rebouças Convention Center, São Paulo, Brazil

Abstract: The most likely paths for the penetration of external interferences into equipments are the interconnecting cables either for power supply or for data transmission and exchange of information from one installation to another. The paper presents an analytical method to calculate the voltage induced on the inner conductor of a cable with an interrupted shield for the case of a grazing illumination. The method is validated by comparisons with measurements performed using an EMP simulator.

Index terms: Cable shielding, EMP

EMC/EMI MODELING TECHNIQUES AND TOOLS**EMCABS: 10-08-96**

Bruce Archambeault
 Seth Corporation, 110 Sunray Drive, Johnstown, PA 15905
 Proceedings of the Reverberation Chamber and Anechoic Chamber Operators Group Meeting,
 Naval Surface Warfare Center, Dahlgren Division, Dahlgren, VA 22448-5100
 NSWCDD/MP-96/38, March 1996, pp. 1-19

Abstract: This paper discusses practical modeling problems and likely equipment EMC/EMI problems. It points out the requirement to identify the radiator, coupling mechanism, and EMI source prior to being able to apply modeling techniques.

Index terms: Modeling, EMI, EMC

SHIELDING EFFECTIVENESS OF ENCLOSURES WITH ARBITRARY CROSS SECTION**EMCABS: 08-08-96**

P. Kistenmacher and A. Schwab
 Institute of Electric Energy Systems and High-Voltage Technology, Karlsruhe University, Germany
 1994 International Symposium on EMC, ISEMC 94 Proceedings, pp. 281-286
 December 5-9, 1994, Rebouças Convention Center, São Paulo, Brazil

Abstract: This paper presents a general analytical solution for electromagnetic shielding problems below resonance frequencies. The solution is valid for enclosures of arbitrary shape with any given combination of materials and wall thicknesses. Considering skin effects, the shielding effectiveness is calculated by solving the Helmholtz equation for every single part of the wall with given thickness and material. The solution for the whole shield is then found by applying the induction law in integral form.

Index terms: Shielding effectiveness, analytical evaluations

A LOW-COST COMPREHENSIVE METHODOLOGY FOR EME EFFECTS ASSESSMENT OF CRITICAL SYSTEMS**EMCABS: 11-08-96**

Celeste M. Belcastro, Ph.D.
 NASA Langley Research Center, MS 130, Hampton, VA 23681-0001
 Proceedings of the Reverberation Chamber and Anechoic Chamber Operators Group Meeting,
 Naval Surface Warfare Center, Dahlgren Division, Dahlgren, VA 22448-5100
 NSWCDD/MP-96/38, March 1996, pp. 107-131

Abstract: Electromagnetic environment (EME) assessment technology being developed at the NASA Langley Research Center involves electromagnetic (EM) field modeling codes for excitation of large geometric structures over a wide frequency spectrum, validation of these codes using ground tests and flight tests of a B757, a multi-chamber test facility, and a closed-loop test capability with real-time function monitoring of the equipment under test.

Index terms: Modeling, EME effects

BAND-LIMITED, WHITE GAUSSIAN NOISE EXCITATION FOR REVERBERATION CHAMBERS AND APPLICATIONS TO RADIATED SUSCEPTIBILITY TESTING**EMCABS: 09-08-96**

Myron L. Crawford (1), Thomas A. Loughry (2), Michael O. Hatfield (3),
 Gustav J. Freyer (4).
 (1) National Institute of Standards and Technology, (2) USAF Phillips Laboratory, (3) Naval Surface
 Warfare Center, (4) Universal Systems Incorporated
 National Institute of Standards and Technology, 325 Broadway, Boulder, Colorado 80303-3328
 NIST Technical Note 1375, January 1996, 116 Pages

Abstract: This report gives the results of demonstration tests conducted to evaluate the electromagnetic environment (EME) produced by band-limited, white Gaussian noise (BLWGN) excitation of a reverberation chamber and to verify its applications to susceptibility and shielding effectiveness testing. Data was collected to compare the EME produced in a reverberation chamber by CW and swept frequency excitation using both mechanical stirring and BLWGN to excite the cavity mode structure. The feasibility of using the BLWGN technique for radiated susceptibility testing was evaluated by comparing it with mechanical stirring in a reverberation chamber and with anechoic chamber results.

Index terms: Electromagnetic environment, mode stirring, noise, quality factor, reverberation chamber, shielding effectiveness

LARGE AIRCRAFT CAVITY PUMPING & COMMERCIAL GPS SUSCEPTIBILITY EVALUATION**EMCABS: 12-08-96**

Dr. Jane M. Lehr
 Phillips Laboratory, Electromagnetic Effects Division PL/WSM, Kirkland AFB
 Proceedings of the Reverberation Chamber and Anechoic Chamber Operators Group Meeting,
 Naval Surface Warfare Center, Dahlgren Division, Dahlgren, VA 22448-5100
 NSWCDD/MP-96/38, March 1996, pp. 135-158

Abstract: This report investigates the feasibility of subsystem testing using pumping of the aircraft cavity and noise modulated frequency stirring. An experimental set-up for GPS vulnerability assessment with comparison to other test methods was used.

Index terms: Mode stirring, EM susceptibility, testing

EMC TEST PERFORMED ON AN EXPERIMENTAL ELECTRIC VEHICLE

Harry W. Gaul, Tom Huettl, and Chuck Powers
Motorola

Proceedings of the Reverberation Chamber and Anechoic Chamber Operators Group Meeting,
Naval Surface Warfare Center, Dahlgren Division, Dahlgren, VA 22448-5100
NSWCDD/MP-96/38, March 1996, pp. 181-191

Abstract: This paper addresses Electromagnetic Compatibility (EMC) tests performed on an experimental electric vehicle. The platform used was an electric converted 1993 Dodge Dakota pickup truck. EMC tests were conducted which included radiated magnetic field and radiated electric field emissions from 9 kHz to 30 MHz. The radiated tests were performed in accordance with the Society of Automotive Engineers (SAE) Draft Standard J551/5. Additional tests were performed on the SAE J1850 multiplex communication bus to measure the induced voltage transients.

Index terms: electric vehicle, electric fields, magnetic fields

EMCABS: 13-08-96**STEPPED-FREQUENCY METHODOLOGY FOR OBTAINING FASTER DATA RATES IN REVERBERATION CHAMBERS OPERATED WITHOUT A MECHANICAL MODE STIRRER**

J. P. Quine and A. J. Pesta
Rome Laboratories, Griffiss AFB, NY

Proceedings of the Reverberation Chamber and Anechoic Chamber Operators Group Meeting,
Naval Surface Warfare Center, Dahlgren Division, Dahlgren, VA 22448-5100
NSWCDD/MP-96/38, March 1996, pp. 277-282

Abstract: A stepped-frequency method is discussed for obtaining faster data rates with a reverberation chamber operated without a mechanical mode stirrer. The conditions for obtaining spatially uniform fields on a time (or frequency) average basis for all three polarizations are reviewed. Computer calculations are presented showing the degree of field uniformity that can be achieved with this stepped-frequency method.

Index terms: reverberation chambers, stepped-frequency modeling

EMCABS: 16-08-96**CALIBRATION OF FULLY ANECHOIC ROOMS AND CORRELATION WITH OATS MEASUREMENTS**

Roger A. McConnell & Clark Vitek

CKC Laboratories, Inc., 5473A Cloud's Rest Road, Mariposa, CA 95338
Proceedings of the Reverberation Chamber and Anechoic Chamber Operators Group Meeting,
Naval Surface Warfare Center, Dahlgren Division, Dahlgren, VA 22448-5100
NSWCDD/MP-96/38, March 1996, pp. 195-207

Abstract: Fully anechoic rooms may gradually replace open area test sites as the preferred type of testing facility for the measurement of radiated emissions. The fully anechoic room offers several advantages over the open area test site: Immunity to high ambient signal levels, the capability of being located in metropolitan areas close to the customer base, more uniform field over a larger area, a reduction in test time since there is no need to scan the receiving antenna in height, and the capability of being used for both emissions and susceptibility testing. Measurements of site attenuation in a fully anechoic room show excellent correlation with the mathematical model for normalized site attenuation in free space. The mathematical model and measurement results are presented.

Index terms: Modeling, anechoic room, OATS

EMCABS: 14-08-96**MODE-STIRRED CHAMBER SHIELDING EFFECTIVENESS MEASUREMENTS VERSUS ANECHOIC CHAMBER MEASUREMENTS: A COMPARISON OF RESULTS**

Michael V. Jessec (1) & Richard Porter (2)

(1) Computer Sciences Corporation, King George, VA & (2) Naval Surface Warfare Center,
Dahlgren, VA
Proceedings of the Reverberation Chamber and Anechoic Chamber Operators Group Meeting,
Naval Surface Warfare Center, Dahlgren Division, Dahlgren, VA 22448-5100
NSWCDD/MP-96/38, March 1996, pp. 315-324

Abstract: This paper represents a continuation of work being performed to determine the feasibility of using mode-stirred chamber (MSC) techniques to measure shielding effectiveness (SE). The results obtained from SE measurements conducted using a generic enclosure (nested chamber) MSC facility are compared to results obtained from measurements conducted over numerous aspect angles using the same generic enclosure assembly. The results obtained using MSC techniques are shown to be in general agreement with results obtained in the anechoic chamber when the MSC is operated at frequencies where adequate mode stirring and spatial averaging occur (the reverberation region) in the enclosure assembly.

Index terms: Mode-stirred chamber, shielding effectiveness

EMCABS: 17-08-96**TRANSMISSION CROSS SECTION OF APERTURES MEASURED BY USE OF A NESTED MSC**

Mats Bäckström and Olof Lundén

National Defence Research Establishment, PO Box 1165, S-581 11 Linköping, Sweden
Proceedings of the Reverberation Chamber and Anechoic Chamber Operators Group Meeting,
Naval Surface Warfare Center, Dahlgren Division, Dahlgren, VA 22448-5100
NSWCDD/MP-96/38, March 1996, pp. 211-219

Abstract: Knowledge of the transmission cross section of apertures constitutes an important factor in design and analysis of electrically large shielded structures. This paper presents a rationale for measuring the transmission cross section of aperture as well as a method to measure it with the use of nested mode stirred chambers. Results of measurements are presented and successfully compared with theoretical predictions.

Index terms: Transmission cross section, mode stirred, shielded structures

EMCABS: 15-08-96**RF COUPLING MEASUREMENTS OF PASSENGER AIRCRAFT AVIONICS EXPOSED TO CAVITY-MODE EXCITATION**

D.M. Johnson (1) and M. O. Hatfield (2)

(1) Computer Sciences Corp., King George, VA, 22485 & (2) Naval Surface Warfare Center,
Dahlgren, VA 22448
Proceedings of the Reverberation Chamber and Anechoic Chamber Operators Group Meeting,
Naval Surface Warfare Center, Dahlgren Division, Dahlgren, VA 22448-5100
NSWCDD/MP-96/38, March 1996, pp. 375-381

Abstract: The performance of avionics installed in aircraft which fly through high-intensity electromagnetic environments is an increasingly important issue. A phase of testing the electromagnetic reverberation characteristics of a transport aircraft has been completed. A part of this testing was the measurement of the radio-frequency (RF) coupling of selected avionics boxes of a decommissioned Boeing 707 aircraft and a simulated avionics box when exposed to cavity-mode excitation. Follow-on tests were and continue to be performed in the mode-stirred chamber.

Index terms: Cavity-mode excitation, stirred mode chamber

EMCABS: 18-08-96

Beijing Symposium on EMC

The 1997 International Symposium on EMC will be held in Beijing, China on May 21-23, 1997. Prospective authors should submit 4 copies of a 35-50 word abstract and 500-700 word summary which explains the contribution, its originality and the relevance to the EMC discipline. They should be sent to: EMC '97/Beijing, c/o Prof. Zhang Linchang, EMC Research Section, Northern Jiaotong University, Beijing 100044, China. The deadline for submission is October 31, 1996. (Please note that the location and deadline are corrected from the previous issue.)

A Call for Papers

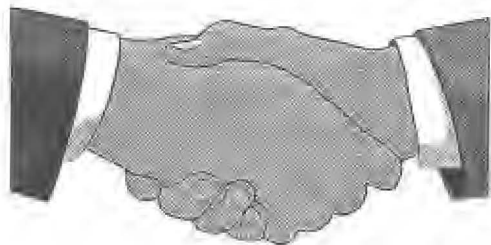
A call for papers was issued for the 1996 19th Convention of Electrical and Electronic Engineers in Israel, which will take place in Jerusalem, on November, 1996. The Symposium will hold a session dedicated to EMC, which is being sponsored and organized by the Israel EMC Chapter. IEEE EMCS members worldwide are encouraged to participate in this event. Fax the Israeli Chapter at 972-9-7657065 for details.

Papers are wanted in the areas of EMC measurements and applications for publication in the *EMC Transactions*.

For more information, contact: Dr. Motohisa Kanda, NIST, 813.30, 325 Broadway, Boulder, CO 80303. Tel: (303)497-5320. Fax: (303) 497-6665.

The Israeli EMC Chapter wishes to extend a welcoming hand to all colleagues, EMC engineers and engineers in related fields from our neighboring countries, particularly from Jordan, Egypt and the PA, and invite them all to hold joint activities, conference meetings, etc.

Additionally, the Israeli Chapter invites engineers from our neighboring countries to participate in our Chapter meetings, and will hold such meetings in English for the benefit of our guests.



Please call the Israel Chapter Chairman or fax to 972-9-7657065 for details.

IEEE EMCS Symposia Schedule

- 1996** Santa Clara, CA
August 19-23
IEEE-EMC Symposium
Santa Clara Convention
Center, Westin Hotel
Chair: David Hantula,
Silicon Graphics
(415)933-1071;
FAX: (415)962-9439
e-mail:
emc96@olympus.enrgrg.com
Web:
<http://reality.sgi.com/csp/emc96/index>
- 1997** Austin, TX
August 18-22
Austin Convention Ctr.,
Hyatt Hotel
John Osburn: (512)835-4684
- 1998** Denver, CO
August 9-14
Radisson Hotel
T.J. Ritenour:
(303)673-7096
- 1999** Seattle, WA
August 2-6
Westin Hotel
Bill Gjertson
(215)591-6478
- 2000** Washington, DC
Washington Hilton
Bill Duff
(703)914-8450
- 2001** Montreal, Canada
Montreal Convention
Center
Christian Dube
(514)633-9679
- 2002** Minneapolis/St. Paul
Dan Hoollihan
(612)658-0250

Calendar

EMC Related Conferences & Symposia

August 14-16
18th PIEZOELECTRIC DEVICES CONFERENCE
 The Ritz-Carlton Hotel
 Kansas City, MO
 Components Group
 Electronic Industries Assoc.
 2400 Wilson Boulevard
 Arlington, VA 22201-3834
 TEL (703) 907-7500
 Fax: (703) 907-7501

August 28 - September 5
ASSEMBLÉE GÉNÉRALE DE L'URSI
 Union Radio-Scientifique
 Internationale and
September 3-5
COLLOQUE INTERNATIONAL SUR LA CEM
 Prof. Arriel
 École Centrale de Lyon
 Tel: (33) 72186098
 Fax: (33) 78433717

September 3-6
7th INTERNATIONAL CONFERENCE ON FERRITES
 ICF7 - Bordeaux Congrès
 Service
 Palais des Congrès
 33300 Bordeaux Lac, France
 Mr. V. Cagan, ICF7 General
 Secretary Office, Versailles
 Tel: (33) 1 39254662
 Fax: (33) 1 39254652

September 18-19
29th ANNUAL CONNECTOR & INTERCONNECTION TECHNOLOGY SYMPOSIUM & TRADE SHOW
 Park Plaza Hotel
 Boston, MA
 EIA Components Group
 (703) 907-7536
 Fax: (703) 907-7501

September 17-20
EMC '96 ROMA INT'L SYMPOSIUM ON EMC
 Faculty of Engineering
 University of Rome
 'La Sapienza'
 Rome, Italy
 Prof. Mauro Feliziani
 Tel: +39 6 448534809/44584810
 Fax: +39 6 4883235/4825380

October 23-25
PARTNERSHIP FOR PEACE SYMPOSIUM ON EMC
 Centro Studi 'I Cappuccini'
 S. Minato, Italy
 M. Giannini, Univ. of Florence
 Electrical Engineering
 Department
 Via C. Lombroso, 4/17
 I-50134 Florence, Italy
 Tel: +39-55-4796753
 Fax: +39-55-4796767
 e-mail:
 giannini@ingel.ing.unifi.it

February 18-20
(held every two years)
EMC ZURICH '97 12th INTERNATIONAL ZURICH SYMPOSIUM AND TECHNICAL EXHIBITION ON EMC
 Dr. Gabriel Meyer, ETH
 Zentrum IKT
 Tel: 41 632 27 90
 Fax: 41 632 12 09

May 21-23
INT'L SYMPOSIUM ON EMC
 Beijing, China
 c/o Prof. Zhang Linchang
 EMC Research Section
 Northern Jiaotong University,
 Beijing

IEEE Administrative Meetings

August 10-17
IEEE EXECUTIVE COMMITTEE MEETING
 To be Announced
 Buenos Aires, Argentina
 Julie Corin: (908) 562-3984

November 1-4
SECTIONS CONGRESS
 Marriott City Center
 Denver, CO
 Carol Coffey: (908) 562-5512

November 4
REGIONS 5 & 10 MEETINGS
 Marriott City Center
 Denver, CO
 Mary Ann Hoffman:
 (908) 562-5506

November 4-5
REGIONS 2, 7 & 8 MEETINGS
 Marriott City Center
 Denver, CO
 Mary Ann Hoffman:
 (908) 562-5506

November 4-6
RAB MEETINGS
 Marriott City Center
 Denver, CO
 Mary Ann Hoffman:
 (908) 562-5506

November 4-7
TAB MEETINGS
 Marriott City Center
 Denver, CO
 Paula Dunne: (908) 562-3919

November 4-8
PUB MEETINGS
 Marriott City Center
 Denver, CO
 Rob Colburn: (908) 562-3972

November 8
EMCS BoD MEETING
 Adam's Mark Hotel
 Denver, CO
 Janet O'Neil: (310) 348-0865

December 8-9
EAB COMMITTEES
 Marco Beach Hilton
 Marco Island, FL
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EMCS Cooperating Symposia

- | | |
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| 1997 | Beijing, China
May 21-23 |
| 1998 | Japan: May 15-17 |
| U.K. | Biannually, even years, in September. |
| Zurich | Biannually, odd years. |
| Wroclaw | Biannually, even years, in June. |

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